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## **1/ Some historical examples of control beliefs**

On February 19, 1616, the *Holy Office in Rome* submitted to its theological experts the following two propositions for their assessment:

1. The sun is the center of the world and hence immovable of local motion.
2. The earth is not the center of the world, nor immovable, but moves according to the whole of itself, also with a diurnal motion.

The theologians met four days later on February 23, and the day after that announced the results of their deliberations. Their conclusions were unanimous. The first proposition they declared to be "foolish and absurd philosophically, and formally heretical, inasmuch as it expressly contradicts the doctrine of the Holy Scripture in many passages, both in their literal meaning and according to the general interpretation of the Fathers and Doctors." The second proposition they declared "to receive the same censure in philosophy, and as regards theological truth to be at least erroneous in faith."

The matter was then handed over to the Congregation of the Index (under the General Congregation

of the Inquisition). On March 5 of the same year this Congregation handed down its decree:

It has ... come to the knowledge of the said Congregation that the Pythagorean doctrine- which is false and altogether opposed to the Holy Scripture-of the motion of the Earth, and the immobility of the Sun, which is also taught by Nicolaus Copernicus in *De revolutionibus orbium coelestium*, and by Diego de Zuniga (in the book) on Job, is now being spread abroad and accepted by many.... Therefore, in order that this opinion may not insinuate itself any further to the prejudice of Catholic faith, the Holy Congregation has decreed that the said Nicolaus Copernicus' *De revolutionibus orbium*, and Diego de Zuniga's *On Job*, be suspended until they be corrected.... In witness whereof the present decree has been signed and sealed with the hands and with the seal of the most eminent and Reverend Lord Cardinal of St. Cecilia, Bishop of Albano, on the fifth day of March, 1616.

So much for the record of the most famous instance of the Church's scrutiny of the affairs of natural science.' Though his name is never mentioned in the passages cited above, it was Galileo who had instigated this whole affair by his defense of the Copernican theory of the motion of the heavenly bodies against the Ptolemaic theory. After reflecting on the matter, the officials of the Church judged that the theory was philosophically-that is, scientifically-absurd. More important (they were, after all, not a

Royal Academy of Science), they judged that the theory contradicted the Holy Scriptures, which they regarded as authoritatively true. Their belief in the authoritative truth of the Holy Scriptures functioned as a control over the scientific theories which they were willing to accept. Likewise, the specific things that they interpreted the Holy Scriptures as saying functioned thus. Because the Copernican theory violated their control beliefs they rejected it. A classic case of the refusal to allow to science\* its free, untrammelled, autonomous, rational progress, is it not?

Let us see.

Less than a century after those deliberations a new dispute wracked the physics of the Western world. Copernicus by now was accepted: the earth moved around the sun, no doubt about it. What was now at the center of inquiry and dispute were the general laws concerning the motion of heavenly and terrestrial bodies. In the first half of the century Descartes had proposed the speculative mechanistic thesis that matter can be moved only by the motion of contiguous matter, that there can be no action at a distance. The physical universe consists not of lumps of matter sprinkled thinly throughout empty space and acting on each other across the void, but of solid

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\*When I use the word "science" in the following pages, I shall always mean by it the academic disciplines-what the Germans call Wissenschaft.

peas of matter floating in a thin soup of ether. The Cartesians saw this vision as freeing them from the "fruitless speculations" of the medieval scientists, who held that all things by their nature seek to come to rest, those with gravity seeking their rest downward and those with levity seeking it upward. With this vision before them the Cartesians set out on a research program designed to discover the detailed mechanistic laws governing the motion of matter.

Then in 1687 Newton published his *Principia*, with its theory of universal gravitational attraction. The Cartesians at once went on the attack, accusing Newton of reintroducing obscurantist medieval ideas of essences and natures. They emphasized the counter-evidence to the Newtonian theory, which they regarded as confirmation of the theory's fundamentally defective character; and they searched for ways to handle the counter-evidence to their own.<sup>2</sup> In this case we see someone's philosophical beliefs functioning as a control over the scientific theories he is willing to accept. But now it is the scientists rather than some clerics whose beliefs function thus. Their control beliefs govern their actual scientific work. Is it possible that scientists themselves can impede the free, untrammelled, autonomous, rational progress of science?

Let us once again take a leap, this time over a bit more than two centuries, to the great physicist Ernst Mach. It was Mach's belief that the task of the natural scientist is to find simple and regular connections between the elements of reality. His inclination

was to regard these elements as sensations. Apparently he viewed this as an ontological *hypothesis*, susceptible to criticism. Methodologically, however, it functioned for him as a touchstone, for he appended to it the principle that natural science should contain only concepts which can be connected with sensations. Since neither the atomic theory of his own day nor the Newtonian theory of absolute space stood up to this requirement, he rejected them and went on to explore how physics might be reconstructed on a sensationalistic basis. To Max Planck's charge that his proposals diverged too far from the actual structure of natural science Mach replied that science had become a church, and that he had no intention of being a member of a church, scientific or otherwise. If necessary, he would renounce the very title of 'scientist.' "Die Gedankenfreiheit ist mir lieber," he said: "freedom of thought is more dear to me."<sup>3</sup>

In Mach's case, again, a philosophical belief—here a somewhat tentatively held ontological vision—functioned as a control within the practice of science, determining the rejection of a variety of theories and requiring alternative lines of thought for its positive elaboration. And now how do we put our question? Who in this melange was impeding the free, untrammelled, autonomous, rational progress of science?

The logical positivists of the 1920s and 1930s held that observation was the solid foundation of all knowledge. Most of them regarded this as settled

truth rather than tentative hypothesis. And all of them differed from Mach in believing that natural science as it is is a specimen of knowledge. They did not seek a critique and restructuring of natural science a la Mach, but a logical analysis exhibiting the connection of the whole scientific superstructure with its observational base. They failed, and the tale thereof has oft been told.<sup>4</sup> But confronted with their failure they did not follow through on their empiricist conviction and toss out that in natural science which is not grounded in observation. Instead they kept their troth to natural science and surrendered their empiricist convictions along with their program of logical analysis.

Here, then, we have an interesting reversal. The positivists used the conviction that the body of natural science is quite all right as it is, as a control within their philosophical activities. It led them to the rejection of certain theories and to the search for alternatives. Natural science rather than philosophy here plays the part of the demanding mistress. But the faith which the positivists displayed in natural science was not itself arrived at scientifically. On the contrary, it resembles in striking ways the confidence of the Congregation of the Inquisition in the veracity of Holy Scripture.